Jan. 11, 1938. C. BRADFORD ET AL 2,104,922

MECHANISM FOR SEPARATING INTERMIXED DIVIDED MATERIALS

Original Filed April 18, 1931 3 Sheets-Sheet 1

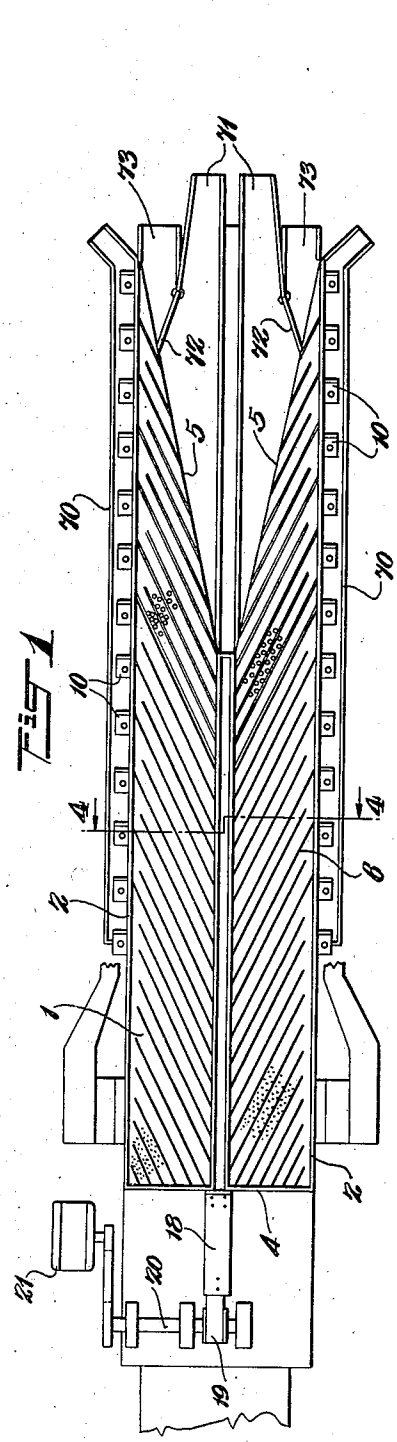


Fig. 1

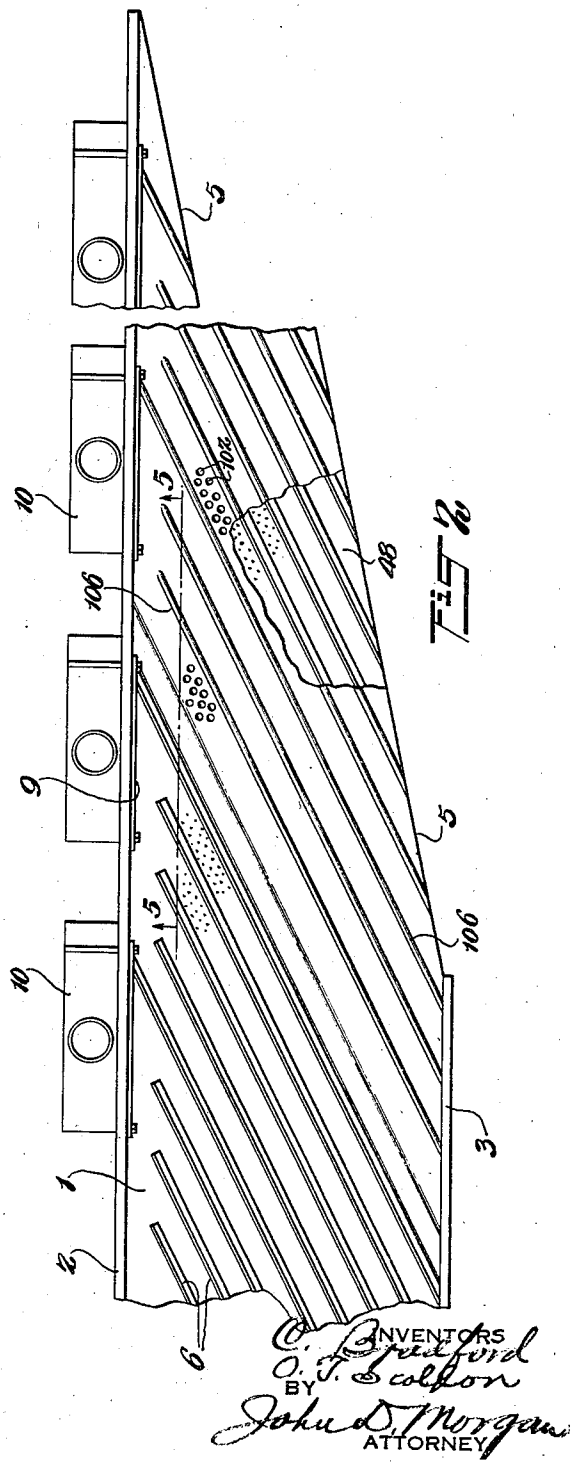


Fig. 2

INVENTORS
C. Bradford
O. T. Colton
BY
John D. Morgan
ATTORNEY

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MECHANISM FOR SEPARATING INTERMIXED DIVIDED MATERIALS

Original Filed April 18, 1931 3 Sheets-Sheet 2

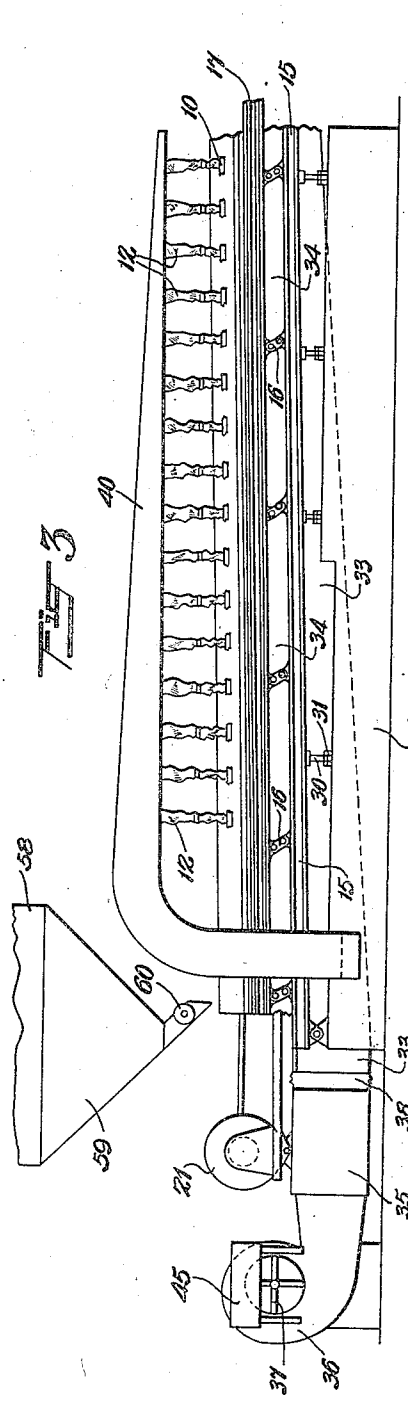


Fig. 3

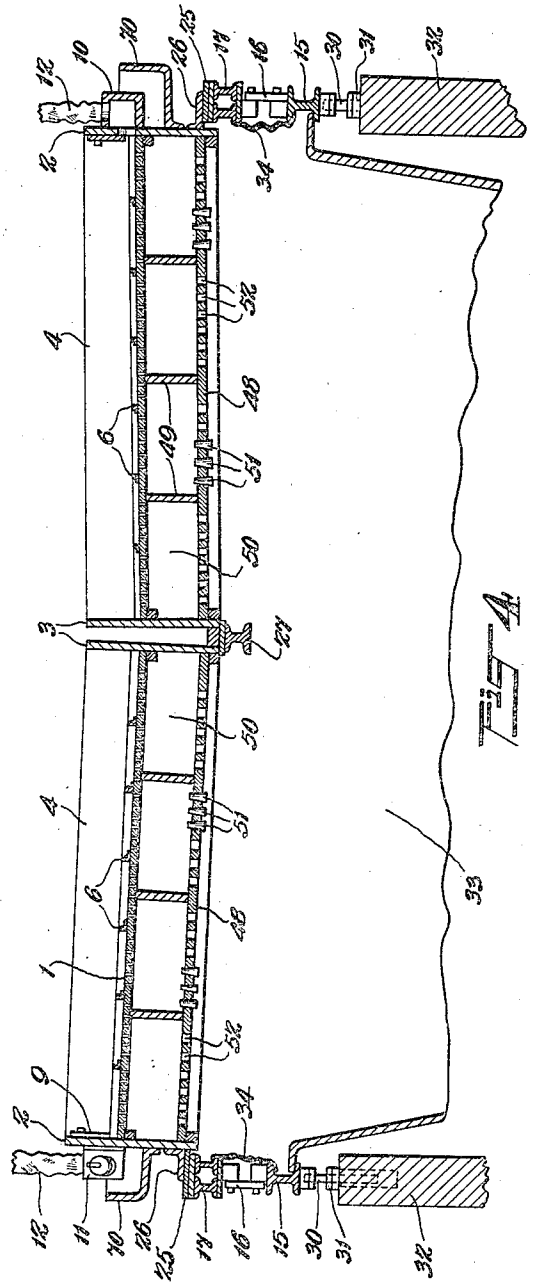


Fig. 4

INVENTORS
C. Bradford
O. T. Sedelow
BY
John D. Morgan
ATTORNEY

Jan. 11, 1938. C. BRADFORD ET AL 2,104,922

MECHANISM FOR SEPARATING INTERMIXED DIVIDED MATERIALS

Original Filed April 18, 1931 3 Sheets-Sheet 3

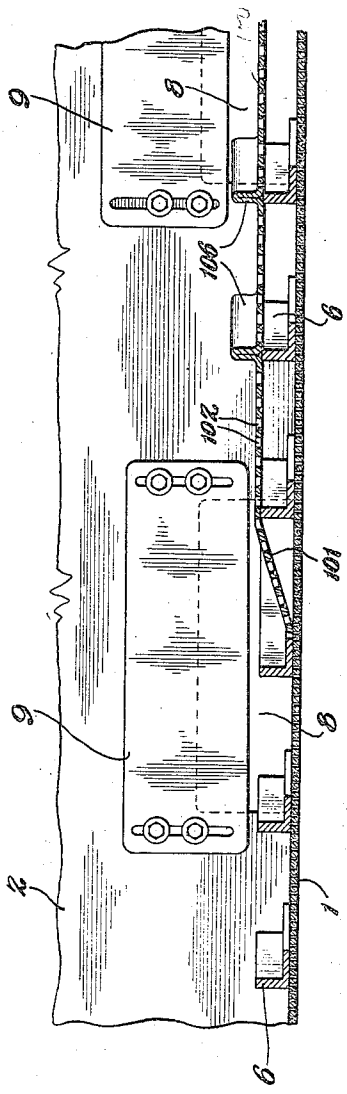


Fig. 5

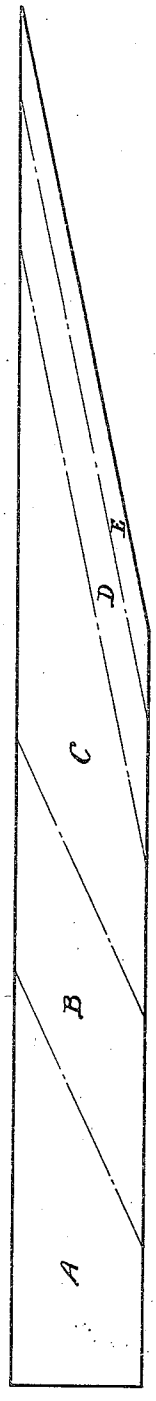


Fig. 6

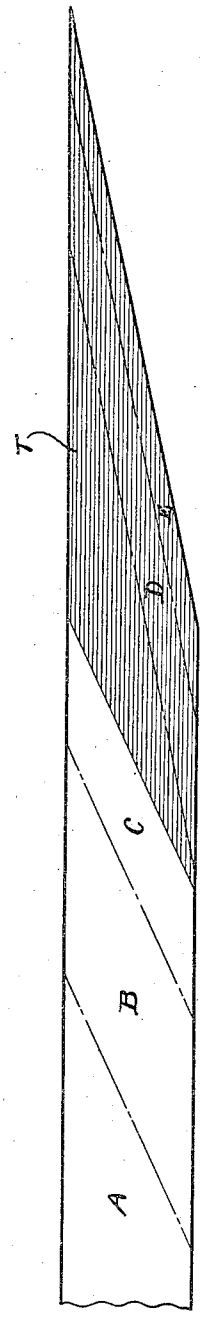


Fig. 7

INVENTORS
C. Bradford
C. J. Bacon
By John D. Morgan
ATTORNEY

Patented Jan. 11, 1938

2,104,922

UNITED STATES PATENT OFFICE

2,104,922

MECHANISM FOR SEPARATING INTERMIXED DIVIDED MATERIALS

Clyde Bradford and Oliver Thomas Scollon, Saint Benedict, Pa., assignors to Richard Peale, Clearfield, Pa., W. Sanders Davies, New York, N. Y., and William B. Oakes, Rutherford, N. J., as trustees

Application April 18, 1931, Serial No. 531,128
Renewed February 16, 1935

15 Claims. (Cl. 209—44)

The invention relates to a novel and useful mechanism for separating intermixed divided materials and, more particularly, to the purification of coal or like materials by dry or pneumatic separating processes and mechanisms, especially when the pieces and particles of the intermixture vary relatively greatly in size and relatively little in their specific gravities.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:—

Fig. 1 is a fragmentary plan view of a coal-cleaning table embodying the invention;

Fig. 2 is an enlarged detail, in plan, of one of the decks shown in Fig. 1, parts thereof being broken away;

Fig. 3 is a side elevation of the table shown in Fig. 1;

Fig. 4 is a transverse vertical section taken on line 4—4 of Fig. 1;

Fig. 5 is an enlarged fragmentary detail, in section, taken on line 5—5 of Fig. 2;

Fig. 6 is a schematic plan of a deck of the cleaning table, showing one layout of air zoning; and

Fig. 7 is a view similar to Fig. 6, showing the location of the fine refuse trap with respect to the zoning.

The invention is directed to mechanism for the cleaning or purification of coal or other intermixed divided materials by dry or pneumatic separating processes and mechanisms. Our invention effects practically complete purification of substantially all kinds of coal by stratification and separation of the heavier impurities, the purified stratum and the heavier impurities being delivered apart from each other and free from intermixture. The invention is more particularly directed to carrying out such a separating process upon raw or impure coal which has not been previously closely classified as to size and which contains in intermixture relatively large pieces and fine particles down to and including substantial quantities of very fine and dustlike particles.

As is well known, it is exceedingly difficult to purify bituminous coal, without first classifying or screening the coal into a great number of closely sized groups or size ranges and separately cleaning each size range upon a separate machine or table. These difficulties inhere from the fact that the differences between the specific gravity of the coal and of the heavier impurities are relatively very slight. In order to make a clean separation, particles which differ by as litle as two or three hundredths of a specific gravity unit must be separated from each other by virtue of said specific gravity differences. When pieces of the lighter substance (coal) occur in intimate intermixture with relatively very much smaller particles of the denser impurities, the separation of these materials according to their specific gravities is a problem of unusually great difficulty. Nevertheless, purification of coal by "dry" or pneumatic processing has been successfully practiced commercially for several years by the Peale-Davis system, even when the pieces and particles vary in size from large lumps as great as eight or ten inches in one or more dimensions down to the fine dust present in the raw coal as it comes from the mine. The Peale-Davis process is disclosed in various prior patents and pending applications filed by Kenneth Davis, Richard Peale and Rembrandt Peale, Jr.

Our present invention is especially directed to improving the separation and removal of the very fine impurities or refuse from the intermixture of raw coal. By our invention, the relatively very fine refuse particles are promptly and completely removed from the intermixture during and as a part of the general separating operation, and without requiring specal or prolonged treatment and/or re-treatment of the intermixture, either in whole or in part.

While, as hereinbefore stated, the Peale-Davis system is capable of completely purifying coal containing fine particles intermixed with larger pieces, the complete purification of the fines of some coals has involved undue prolongation of the process or has required special devices and treatments of all or part of the intermixture. As hereinbefore indicated, and as more fully explained in copending application Ser. No. 283,600 of Richard Peale et al., now Patent No. 1,983,487, dated December 4, 1934; application Ser. No. 389,722 of Richard Peale, now Patent No.

1,976,292, dated October 9, 1934; application Ser. No. 393,736 of Rembrandt Peale, Jr., now Patent No. 2,038,126, April 4, 1936, and application Ser. No. 498,016 of Richard Peale et al., certain coals present unusually difficult cleaning problems because of a disproportionate preponderance of very fine refuse particles in the unsized intermixture.

Due to the operation of the physical laws which govern the stratification of particles in a pneumatic separating operation, the finest heavy particles naturally require a longer time and greater amount of processing before they settle to the inferior stratum of impurities. Consequently, when a preponderance of such fine refuse occurs the separating action may be unduly prolonged in order to effect complete stratification of the fines. Furthermore, it is frequently difficult to maintain stratification and settlement of the fine refuse until it has been completely removed from intermixture. That is, after the fine refuse has settled, it must be progressed a considerable distance along the surface of the pervious deck or table and during such progress, it is difficult to prevent remixture thereof with the superior stratum of coal. The rising air currents tend to blow the fine refuse back into the superposed coal stratum. This remixing action is especially prevalent when a pronounced size classification of the coal takes place in the bed, because the air currents are apt to blow the settled fine refuse particles up through the voids or interstices in those areas of the bed where the larger pieces of coal congregate. This undesirable remixing action is more fully described and illustrated in said Peale application Ser. No. 498,016.

One of the primary objects of the present invention is to insure complete and immediate removal of the settled fine impurities from the bed and to prevent possible remixing thereof. The invention provides a process and means for removing the fine refuse particles from the bed substantially instantaneously after they have settled to an inferior stratum and without necessitating progression of said particles along the surface of the table. By virtue of our invention, as soon as a fine particle of heavy material settles beneath the coal-containing strata, that particle is instantly and permanently removed from intermixture. This separation of the fine refuse is accomplished as a concomitant part of the general separating operation and without in any wise disturbing or retarding the progress and efficiency of said operation. The stratification and separation of the remaining portion of the materials takes place without interruption and without substantial change and, by virtue of the invention, it is frequently possible to curtail the amount of time, treatment and equipment required for the complete purification of a given mass of coal.

In its present preferred embodiment, the invention is applied to the well-known separating table of the Peale-Davis system although in many of its aspects the invention is applicable to and can be used with other types of cleaning tables and with other pneumatic processes as well. Briefly, as the fine refuse particles settle to the air-pervious surface of the deck, they are immediately extracted from the bed and permanently isolated therefrom. The removal of the fine refuse from the bed takes place instantaneously upon stratification and without substantial progression of the settled fine particles along the bottom of the bed of coal by friction and inertia. This removal of the fine refuse takes place without in any wise disturbing the stratification of the bed and without interrupting the flow of the flotant coal or the progression of the settled larger pieces of heavy material along the bottom of the bed.

The present preferred means for extracting the settled fine refuse comprises an apertured platform or a screen which underlies a selected area of the bed and overlies the corresponding air-pervious surface of the deck. The apertures in the platform are large enough to permit downward passage of the fine refuse particles below a predetermined size while the remainder of the bed passes over the platform and is subjected to the separating actions of the air currents, the vibration and the separating partitions just as though the perforated platform were not present. The air currents rising through the pervious deck and the perforated platform, float the coal pieces and particles in superposed strata, so that the fine coal particles never reach the platform and so do not filter therethrough. The larger settled refuse pieces cannot pass through the platform apertures and so travel along the platform by friction and inertia and are guided to discharge by separating partitions in the usual manner. Only the fine refuse particles are screened through the platform and are thus instantaneously and permanently segregated from the bed. Suitable means are provided for collecting and delivering the fine refuse particles which are extracted and trapped by the platform and its cooperating devices.

Our invention has proved exceedingly efficacious in the purification of coal, especially when the fine refuse particles are preponderant in quantity and/or difficult to separate as hereinbefore explained. By virtue of the invention, the size of the separating table and the time required for completely purifying a given mass of coal is greatly reduced, while in many cases the necessity for a retreatment operation and table or other special processing is eliminated. In actual operating conditions, we have found that what we will hereinafter conveniently term the "fine refuse trap" embodied in our invention will successfully remove fine material which tests 80 per cent or upward in free ash content. Heretofore, a very large proportion of this exceedingly fine refuse could not be removed from the coal and was discharged in intermixture therewith for the reasons hereinbefore explained.

The foregoing general description and the following detailed description as well are exemplary and explanatory of the invention but are not restrictive thereof.

Referring now in detail to the present preferred embodiment of the invention, illustrated by way of example in the accompanying drawings, the same is shown as applied to a Peale-Davis table of the modern type, although it will be understood the invention is applicable to other types of cleaning tables as well.

Referring first to the general structure and operation of the cleaning table, said table comprises one or more relatively long and narrow, air-pervious decks 1, (Figs. 1, 3 and 4) having longitudinal bed-retaining walls 2 along the outer side edges thereof, similar but shorter bed-retaining walls 3 along the inner sides, and rear bed-retaining walls 4 across their rear ends. The front ends of the decks are preferably formed with relatively long diagonal spillage edges 5 dis-

posed from the front ends of the inner bed-retaining walls 3 forwardly and outwardly to the front ends of the outer walls 2, thus providing a relatively long and unobstructed spillage edge for the great mass of coal which travels longitudinally of the decks to discharge at the front ends thereof.

The deck is provided with a plurality of substantially parallel separating partitions 6 disposed forwardly and outwardly along the deck from the inner wall 3 up to or near the outer wall 2 for guiding settled heavier material along the surface of the deck to discharge. Controllable spaced-apart discharge openings 8 are provided in the outer wall of the deck, said openings extending from the surface of the deck upwardly, and the vertical extent thereof being controlled by vertically slidable members 9 mounted on the inner face of wall 2. The openings 8 communicate with refuse boxes 10 having means for controlling the quantity and quality of material discharged from the table, including weighted discharge gates 11 and regulable, flexible conduit 12 for introducing a supplementary discharge-controlling air blast into the boxes.

The decks 1 are mounted for longitudinal reciprocation, being supported on a stationary frame formed of I-beams 15 by links or arms 16 pivotally connected at their upper and lower ends to the beams 15 and I-beams 17 of the vibratable supporting frame of the decks respectively. Means for longitudinally reciprocating the decks comprise the reciprocable pitman or driving rod 18 connected to the rear end of the reciprocating frame of the decks and driven from an eccentric 19 on the drive shaft 20. The drive shaft 20 may be driven from any suitable power source, such as the electric motor 21.

The decks are normally inclined upwardly toward their outer sides, such inclination being relatively slight however, the usual limits thereof being between level and a maximum slope of two inches to the foot although, of course, the invention is not restricted to these limits. Means are provided for varying the transverse slopes of the decks, comprising removable spacing wedges 25 which may be inserted between the tops of the I-beams 17, which form the vibratable frame for the decks, and the supporting flanges 26 which extend from the lower portions of the outer walls 2. The decks are supported at their inner abutting sides by a common I-beam 27, upon which the bottom faces of the inner walls 3 rest.

The table structure is also provided with means for varying the longitudinal slope of the table, which as shown in Fig. 3 is sloped forwardly and upwardly. As embodied, the stationary frame of the table, composed of I-beams 15, is supported upon a plurality of screw-threaded pedestals 30, which are mounted for vertical positioning movement in the sockets 31 formed in the stationary foundation walls 32. The longitudinal slope of the table may be varied as desired, so that the front end of the table is above, level with, or below the rear. Such variations, however, will be relatively slight, and are usually within small fractions of an inch per foot of length.

The means for supplying lifting and loosening air currents to the table comprises a stationary air chamber 33 below the movable portions of the table and supported within the stationary foundation walls 32. The chamber extends the full length beneath the decks and may be of different depths in different parts thereof to control the pressure of the air along the table. A flexible connecting seal 34 of canvas or the like may be provided between the top of the air chamber and the vibratable frame of the table. Means for supplying air under pressure to the air chamber 33 comprises connecting conduit 35, which leads from the housing 36 of the fan 37. A flexible connection 38 is provided between the stationary conduit 35 and the vertically adjustable air chamber 33. A header 40 is tapped into the air chamber near the rear end thereof and extends upwardly and forwardly above the table for supplying air to the ducts 12 of the refuse boxes.

A plurality of devices may be provided for regulating and controlling the action of the air forces supplied to the bed of materials on the table. Means for primarily controlling the volume of air supplied to the air chamber and thus controlling the pressure head of air in the air chamber, comprises variably-positionable veils 45, which are mounted on the fan housing and are movable vertically to control the amount of air drawn into the fan. The intensity of the air currents supplied to the bed of materials may be graduated areally of the table, as by providing the air pervious decks with a gradated series of zones of different perviosities. As shown in Fig. 6, the deck is provided with a series of zones A, B, C, D and E of different perviosities, so preferably arranged as to cause the intensity of air action to decrease gradually and progressively forwardly along the deck in the direction of flow of the lighter material. The table may also be provided with means for locally and flexibly varying the air action independently of the general gradation or zoning. As embodied, the decks may be provided with a plurality of relatively small and independent sub-zones, such as are shown and described in the prior copending application of Kenneth Davis, Ser. No. 252,544, filed December 19, 1927. As embodied, the vibratable table is provided with an apertured sub-deck 48 mounted below and parallel to the main air-pervious deck 1, while the space between the sub-deck 48 and the main deck 1 is sub-divided into a plurality of independent chambers by the longitudinal partitions 49 and the transverse partitions 50. The air supplied to any chamber may be flexibly controlled by inserting or withdrawing corks or stoppers 51 from the apertures 52 in the sub-deck.

The embodied means for supplying and feeding the raw coal to the table comprises a feed bin diagrammatically indicated at 58, and having a feed hopper 59 positioned above the rear end of the table. The feed hopper is preferably provided with positively driven feeding devices which may be controlled in any desired manner to regulate the amount of material fed to the table.

Referring now to the general operation of the process, the principal steps thereof will be described in connection with the separation of a given raw or impure coal to be treated upon the table. Usually the coal from a mine is first subjected to washability tests to predetermine the characteristics of the coal and its adaptability for cleaning. Such tests will indicate the amount of good coal and impurities at each specific gravity over a comprehensive specific gravity range, and from the tests washability curves are made up so that the specific gravity point at which the most efficient cleaning and recovery of clean

coal can be made may be selected from the curves.

Having determined the specific gravity at which the "split" between the "sinks" and the "floats" should be made for the most efficient and economical separation, the table is constructed and the separating forces tuned so as to preliminarily approximate the desired separating action. In constructing the table, the relative areas occupied by the different zones of the pervious deck will be largely governed by the amounts of impurities or sinks in the different size ranges of the mass of coal to be treated. For example, if there is a relatively large proportion of sinks in the largest size range of the coal, the area of zone A will be correspondingly large, while the zones for the smaller sizes will be approximately proportioned to the quantities of sinks in their respective size ranges. Other factors in the separating process, including the volume of air delivered by the fan, the water-gauge pressure of air in the air chamber, the amount of material to be fed to the table, the amount of the transverse and longitudinal inclinations, the speed of reciprocation, and the distribution of the air by the sub-areal zoning system, may likewise be approximately predetermined from the indications of the washability tests.

Having preliminarily tuned or coordinated the settings of the various separating forces as indicated, the coal is run over the table. Generally speaking, the feed of the material is proportioned so as to maintain upon the table a continuous bed of material of substantial depth progressing slowly forwardly from the rear to the front end of the table.

Under the combined action of the vibration or shaking of the bed and the lifting and loosening air forces, the bed rapidly undergoes a more or less rough stratification near the rear end of the table, the coal rising and floating as a superior stratum and the heavier impurities or sinks slowly settling through the unsized bed. The flotant material is progressed generally forwardly throughout the length of the table and undergoes a progressive purification as the sink material, from the largest pieces down to the finest particles, gradually and progressively sink through the bed. Substantially as soon as the sink material has settled to the table surface or below the tops of the separating partitions, it is guided and impelled transversely by friction and inertia to the refuse boxes along the outer side edge of the bed. The amount and nature of the material discharged through the refuse boxes is controlled by the setting of the slides 9, the force of the air blasts from the ducts 12, and by the weighting of the discharge gates 11, and in addition by the settings of the table inclinations and the regulation of the air action.

With the preferred zoning and control of the air currents, the relatively high intensity of the air action in the rear of the bed loosens the particles sufficiently to cause all or most of the largest sink material to settle through the unsized bed during the early stages of the separating action, while in the forward portion of the bed where the air intensity progressively decreases, more and more of the finer sink material is stratified and discharged. It will be understood, of course, that this sequential settling of sinks according to the order of decreasing size is approximate and not necessarily a clean-cut size classification.

The flotant and purified stratum of coal, which normally comprises 80 percent or more of the total mass of raw coal, will be discharged forwardly along the diagonal spillage edge 5 and usually will be conveyed directly to the railroad cars. The refuse which is discharged from the refuse boxes 10 is carried away by the chutes 70 either to the dump or to the retreatment table.

Chutes 71, which receive and convey the coal from the table, may be provided with variably positionable cutting fingers 72 which operate to segregate the "middlings" from the clean coal and direct said middlings into chutes 73, whence they may be returned to the feed bin 58 for further separating action on the table.

As already stated, our invention may be embodied in a Peale-Davis table such as hereinbefore generally described. Accordingly, a selected area of the pervious deck is provided with an apertured platform or "false bottom" which serves to extract or screen out the finer particles of refuse as they sink to the bottom of the bed, without disturbing the general stratifying and separating action upon the other materials which compose the bed. As embodied, a selected area of the deck, indicated in Fig. 7 by the shading T, is provided with an apertured cover or platform 100 (Fig. 5) which overlies and preferably rests upon the upper edges of the separating partitions 6. The rear or initial edge portion 101 of the platform is inclined downwardly and rearwardly from its general level to merge with the plane of the deck surface 1 in front of the next adjacent separating partition 6, thereby providing a ramp for the bed as it travels forwardly onto the platform 100. The structure of the deck and arrangement of the separating partitions 6 beneath the platform 100 are unchanged, and structurally the "fine refuse trap" may be formed by laying a sheet of screening over the tops of the separating partitions in the selected area. It will be noted that the air currents can pass through the covered portion of deck 1 as usual, and thence through the superposed apertured platform 100.

As shown, platform 100 is provided with apertures 102 through which the fine refuse particles can filter. These apertures are of suitable diameter to effect screening-out of the predetermined size range of fine impurities. For example, in cleaning a particular coal, we have found that the apertures may be one-eighth inch in diameter, but it will be understood that this dimension is given only for the sake of illustration and in no wise restricts the invention. It will be understood, of course, that in practically every case the apertures in the platform 100 are many times greater in area than those in the pervious deck 1. The latter are designed with a view to admitting the rising air currents while preventing downward passage of any material therethrough.

The platform 100 is provided with members 106 which function in the same manner as separating partitions 6 in guiding and impelling the settled heavy material (which is too coarse to pass through apertures 102) along the surface of platform 100 and to discharge through the refuse box openings 8. As shown, the upper set of separating partitions 106 are conveniently formed as folds or lips in the otherwise plane surface of the platform. It will be understood, however, that any other suitable equivalents may be used, such as angle pieces similar to those provided for the separating partitions 6.

The "fine refuse trap" of our invention is provided with means for disposing of the fine impurities which pass through the platform 100.

As shown, the separating partitions 6 of the original deck structure serve as supporting and dividing walls between the upper platform 100 and the lower deck 1 of the trap, and these walls also guide and impel the fine refuse along the surface of deck 1 to discharge through the openings 8 of the refuse box. As shown in Fig. 5, the slides 9 of the refuse boxes adjacent the outer edge of platform 100 are raised high enough to permit discharge of both the larger pieces of refuse from the platform 100 and of the fines from the deck surface 1 of the trap.

The dividing walls formed by the separating partitions 6 also serve to keep the rising air currents traveling straight upwardly through the trap and through the bed of coal on the platform. That is, the superposed platform 100 has little or no effect in baffling the air, and cross currents in the trap are prevented by the confining action of the partitions 6.

In accordance with our invention, the "fine refuse trap" is preferably located on that portion of the deck where the fine refuse is stratified. Accordingly, the location of the trap, (indicated by shaded area T, Fig. 7) will generally be in the areas of the deck where the air current is of relatively low intensity. As hereinbefore explained, with a deck having zones or gradations of air intensity, such as those shown in Fig. 6, for example, the greater proportion of the large refuse pieces will settle relatively early in the process and in the zones of greater air intensity, while the fine refuse will, for the most part, remain flotant until it reaches the more forward zones C, D, and E, where the air intensity is decreased. Accordingly, we have found it generally preferable to locate the trap near the front end of the table and over the zone or zones of low air intensity. In this way, the fine refuse is extracted or screened out of the bed substantially as soon as it begins to stratify and is thus immediately removed from intermixture with the bed.

As indicated in Fig. 7, the trap T may and preferably will overlie parts of several zones of air intensity. However, the extent and location of the trap will depend largely upon the characteristics and cleaning-performance of the particular coal being acted upon. For example, some coals will have a relatively small proportion of fine refuse and a trap area considerably less extensive than that indicated in Fig. 7 will suffice, while in other cases the trap area will be greater. It will be understood that the extent of the area occupied by the trap platform will be varied in accordance with the characteristics of the coal and calibrated so as to be proportionate to the quantity of the fine refuse in the particular coal.

In this respect, the method of calibrating the trap area will be somewhat similar to the calibration of the "zoning" or distribution of air intensities, in accordance with the usual Peale-Davis practice. That is, as hereinbefore explained, it is usual to calibrate the areas of the deck devoted to the different zones A, B, C, etc., proportionately to the relative quantities of impurities in the different size ranges of the coal being treated. If there is a relatively great amount of refuse in the largest sizes of the raw coal, a correspondingly great proportion of the deck will be devoted to the zones A and B of relatively high air intensity, while the weaker zones will be proportioned according to the distribution of refuse in the finer sizes. Similarly, the proportionate area occupied by the trap platform will vary with the proportionate amount of refuse in the sizes below the predetermined maximum size to be screened through the trap platform.

Furthermore, the size of the apertures 102 in the trap platform 100 will vary considerably upon the characteristics of the coal to be processed. With many coals, the impurities preponderate in the relatively very fine particles, say below one thirty-second of an inch, while the fine sizes above one thirty-second may be relatively clean, and in such case it may be desirable to utilize the trap mechanism only for such very fine sizes; while with other coals, the size range of relatively dirty fines may extend considerably higher, say up to one-eighth or one-fourth inch, and the size of the apertures in the trap platform will be increased accordingly.

While we have shown the location of the trap as extending from an intermediate point forwardly to the front end of the deck, it will be understood that the position thereof on the deck will be governed by the separating action in any case. Generally speaking, the trap will be located in that area of the table where the predetermined range of fine particles settle in sufficient quantities to warrant their immediate extraction.

The general operation of the trap mechanism in connection with the cleaning action of the table will be clear from the foregoing description but may be briefly summarized as follows:

As already described, in the general separating operation, the larger pieces of heavy material are rapidly loosened apart and settle to the bottom of the bed under the action of the relatively strong air currents in the rear of the table. As the bed progresses forwardly along the table and into zones of lower air intensity, the intermediate and finer particles of the sinks or impurities progressively stratify. As these different sizes of sinks are stratified, they are impelled along the table by friction and inertia to discharge through the side refuse boxes.

In the meanwhile, the coal is floated on the air currents and progresses forwardly along the table above the separating partitions, becoming gradually and progressively purified by the elimination of the settled impurities. As the flotant stratum of coal approaches the refuse trap area T, a considerable portion of relatively very fine sink or refuse particles will still be partially flotant and in intermixture with the coal. In passing over zone C, for example, these fine refuse particles will gradually sink and be at or near the surface of the table as the bed passes onto the perforated platform 100 of the trap. As these fine heavy particles settle to the surface of the trap platform 100, they will fall through the holes 102 and thus be immediately segregated from the remainder of the bed. The bulk of the bed, consisting of the lighter coal stratum will be floated and sustained by the air currents which pass upwardly through the platform without substantial interruption or deflection. Thus none of the coal passes through the platform. Any relatively large pieces of heavy material not already discharged will be impelled along the platform surface by the separating partition devices 106 and discharged through the refuse boxes in the usual manner.

The fine refuse particles which sift or filter into the trap through the platform 100 are progressed along the deck surface 1 by the separating partitions 6 and to discharge through the

refuse boxes or disposed of in any other suitable manner. The platform 100 acts as a perfect barrier to prevent the air currents from blowing the fine refuse in the trap back into the bed.

Frequently in the operation of a Peale-Davis table, a size classification takes place among the pieces and particles in the upper strata of the bed concurrently with the separating action. In the more usual mode of operation, the large coal pieces will travel toward the upper and outer side of the deck while the fines will congregate along the lower and inner side. Thus the coal stratum discharged from the front end of the table is transversely classified as to size.

The fine refuse trap of our invention is particularly efficacious in counteracting the undesirable effects of the classification action just described. Much of the fine impurities are carried along with the fine coal and do not sink to the lower stratum until near the delivery edge 5. These settled fine particles must then travel the full width of the deck to reach the refuse boxes and consequently the danger of remixture and discharge thereof with the coal is great. However, when the refuse trap is provided near the front end of the table, as hereinbefore described and as shown in the drawings, the fine refuse is segregated from the bed as soon as it settles and the possibility of remixture is thereby obviated.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What we claim is:—

1. A mechanism for separating intermixed divided materials including in combination an air-pervious support, means for vibrating the support, means for feeding and maintaining a bed of the intermixed materials undergoing separation upon the support, means for passing lifting and loosening air currents through the bed, an apertured platform overlying the support, means for progressing the bed over said platform, means for delivering relatively fine heavy particles through the platform, means for traversing larger pieces of setled heavy material along the surface of the platform, and means for separately delivering a superior flotant stratum of purified lighter material from the bed.

2. A mechanism for separating intermixed divided materials including in combination an air-pervious support, means for vibrating the support, means for feeding and maintaining a bed of the intermixed materials undergoing separation upon the support, means for passing lifting and loosening air currents through the bed, an apertured platform overlying a selected area of the support, means for progressing the bed over said platform, means for delivering relatively fine heavy particles through the platform, means for traversing larger pieces of settled heavy material along the surface of the platform, and means for separately delivering a superior, flotant stratum of purified lighter material from the bed.

3. A mechanism for separating intermixed divided materials including in combination an air-pervious support, means for vibrating the support, means for feeding and maintaining a bed of the intermixed materials undergoing separation upon the support, means for passing lifting and loosening air currents through the bed, an apertured platform overlying the support, means for progressing the bed over said platform, means for delivering relatively fine heavy particles through the platform, devices on the support below the platform for collecting said fine heavy particles, and means for progressing larger pieces of settled heavy material and a flotant stratum of lighter material over the platform.

4. A mechanism for separating intermixed divided materials including in combination an air-pervious support, means for vibrating the support, means for feeding and maintaining a bed of the intermixed materials undergoing separation upon the support, means for passing lifting and loosening air currents through the bed, separating partitions on the surface of the support for guiding and impelling heavier material therealong, an apertured platform overlying a portion of the support, means for progressing the bed over said platform, separating partitions on the platform, and devices below the platform for collecting the fine heavy particles which filter through the apertures thereof.

5. A mechanism for separating intermixed divided materials including in combination an air-pervious support, means for vibrating the support, means for feeding and maintaining a bed of the intermixed materials undergoing separation upon the support, means for passing lifting and loosening air currents through the bed, separating partitions on the surface of the support for guiding and impelling heavier material therealong, an apertured platform overlying a portion of the support, means for progressing the bed over said platform, separating partitions on the platform, and devices on the air-pervious support below the platform for collecting the fine heavy particles which filter through the apertures thereof.

6. A mechanism for separating intermixed divided materials including in combination an air-pervious support, means for vibrating the support, means for feeding and maintaining a bed of the intermixed materials undergoing separation upon the support, means for passing lifting and loosening air currents through the bed, separating partitions on the surface of the support for guiding and impelling heavier material therealong, an apertured platform overlying a portion of the support, means for progressing the bed over said platform, and devices on the air-pervious support below the platform for collecting and delivering the fine heavy particles which filter through the apertures thereof.

7. A mechanism for separating intermixed divided materials including in combination an air-pervious support, means for vibrating the support, means for feeding and maintaining a bed of the intermixed materials undergoing separation upon the support, means for passing lifting and loosening air currents through the bed, separating partitions on the surface of the support for guiding and impelling heavier material therealong, an apertured platform overlying a portion of the support, means for progressing the bed over said platform, separating partitions on the platform and separating partitions between the platform and the air-pervious support for collecting and discharging the fine heavy particles which filter through the apertures of the platform.

8. A mechanism for separating intermixed divided materials including in combination an air-pervious support, means for vibrating the support, means for feeding and maintaining a bed of the intermixed materials undergoing separa-

tion upon the support, means for passing lifting and loosening air currents through the bed, an apertured platform overlying the support, means for progressing the bed over said platform, means for delivering relatively fine heavy particles through the platform, means for traversing larger pieces of settled heavy material along the surface of the platform, and means for separately delivering a superior, flotant stratum of purified lighter material from the bed and means for passing the air currents in different amounts through the apertures of the platform.

9. A mechanism for separating intermixed divided materials including in combination an air-pervious support, means for vibrating the support, means for feeding and maintaining a bed of the intermixed materials undergoing separation upon the support, means for passing lifting and loosening air currents through the bed, an apertured platform overlying the support, means for progressing the bed over said platform, means for delivering relatively fine heavy particles through the platform, means for traversing larger pieces of settled heavy material along the surface of the platform, and means for separately delivering a superior, flotant stratum of purified lighter material from the bed and means for passing the air currents in different amounts through different parts of that area of the pervious support covered by the platform.

10. In a mechanism for separating intermixed divided materials, in combination, a vibratable air-pervious support, an apertured platform overlying a portion of the support, means for progressing a bed of intermixed materials over the support and platform, and means for traversing settled heavy impurities along that portion of the support uncovered by the platform, means for traversing other settled impurities along the surface of the platform, and means on the support below the platform for traversing therealong the fine particles of impurities which filter through the apertures of the platform.

11. In a mechanism for separating intermixed divided materials, in combination, a vibratable air-pervious support, an apertured platform overlying a portion of the support, means for progressing a bed of intermixed materials over the support and platform, separating partitions on the portion of the support uncovered by the platform, and means on the support below the platform for separately collecting and segregating the fine particles of heavy material which filter through the platform.

12. In a mechanism for separating intermixed divided materials, in combination, a vibratable air-pervious support, a plurality of separating partitions thereon, an apertured platform overlying the support and the separating partitions, means for passing lifting and loosening air currents upwardly through the support and platform, and means for progressing a bed of intermixed materials over the support and over the platform.

13. In a mechanism for separating intermixed divided materials, in combination, a vibratable air-pervious support, a plurality of separating partitions thereon, an apertured platform overlying the support and the separating partitions, additional separating partitions on the upper surface of the platform, means for passing lifting and loosening air currents upwardly through the support and platform and means for progressing a bed of intermixed materials over the support and over the platform.

14. In a mechanism for purifying unsized coal in combination an air-pervious deck, means for passing air upwardly through the openings in said deck, a second air-pervious deck above the first deck and whereon the materials undergo pneumatic stratification, separating partitions or riffles on said upper deck, the space between the two decks being about the height of a riffle, air passing from said first deck directly upwardly through the second deck thereabove.

15. In a mechanism for purifying unsized coal in combination an air-pervious deck, means for passing air upwardly through the openings in said deck, a second air-pervious deck above and spaced a short distance from said first deck and whereon the materials undergo pneumatic stratification, air passing from said first deck directly upwardly through the second deck thereabove, the openings in the upper deck being large enough to permit screening through of a predetermined size range of said materials and the openings in the lower deck being so small as to substantially prevent such screening.

CLYDE BRADFORD.
OLIVER THOMAS SCOLLON.